Vanessa A. Countryman
Secretary
Securities and Exchange Commission
100 F Street NE
Washington, DC 20549-1090.

June 17, 2022

RE: The Enhancement and Standardization of Climate-Related Disclosures for Investors, File No. S7-10-22

Dear Secretary Countryman:

Introduction

The undersigned organizations appreciate the opportunity to provide our perspective on the Security and Exchange Commission's (SEC) proposed Enhancement and Standardization of Climate-Related Disclosures for Investors rule (Proposed Rule).

Collectively, the undersigned companies represent the majority of advanced methane emissions screening and monitoring technologies being used in the oil and natural gas industry today. Our organizations have a deep understanding of the greenhouse gas (GHG) emission footprint of the oil and natural gas industry. This understanding is based on, collectively, hundreds of thousands of actual emissions measurements and extensive partnerships with the industry. Based on our extensive experience, we recommend that the SEC (1) clearly articulate that certain industry sectors, particularly the oil and gas industry, use more tailored, industry-specific GHG reporting standards as a part of their climate disclosure practices, and (2) require measurement-based approaches whenever possible and incorporate vetted and standardized GHG accounting methodologies.

We recognize that the SEC is developing an economy-wide standard to manage climate risk disclosure, but we believe the lessons learned from our actual measurements of GHGs provide important context for how the SEC should develop and implement these standards. We agree with the SEC's premise to rely on established, credible disclosure frameworks. While the proposed Task Force on Climate-Related Financial Disclosure (TCFD) framework is broadly understood and could serve as a consistent standard for most sectors, we believe that industry-specific standards are both viable and necessary for certain industries, particularly the oil and natural gas industry (including all segments of the value chain: production, transmission, and distribution).

How should the SEC balance broad acceptance of standards with accuracy?

TCFD and similar standards such as the Sustainability Accounting Standards Board (SASB)

incorporate the emissions calculation methodologies outlined in the Greenhouse Gas Protocol (GHG Protocol). Accepted methodologies under the GHG Protocol range from direct measurement to emissions-factor-based approaches. Despite the GHG Protocol's guidance to "use the most accurate calculation approach available . . . that is appropriate for their reporting context," many companies that voluntarily report GHG emissions under TCFD or other GHG-Protocol-based frameworks still rely heavily on emissions factor-based inventory approaches that are dated and, in some cases, ultimately misleading for investors. A recent study conducted by Columbia University's Center on Global Energy Policy found that even with the broad use of TCFD for upstream oil companies, there are discrepancies that translate into uneven disclosures across the sector, making it difficult for investors to compare companies.[1]

There is growing scientific evidence (discussed in more detail below) that emissions factor-based estimates grossly underestimate actual emissions from the oil and gas industry. While these approaches to estimating emissions may be appropriate for some industries, and even for certain scopes of emissions (such as Scope 3 emissions) in other industries, the oil and natural gas industry has much more granular and accurate emissions data available for its Scope 1 emissions. This is in part because the work of our organizations has revealed large discrepancies between actual measured emissions and inventory estimates derived from emissions factors. Cost-effective, measurement-based emission quantification technologies are readily available and are becoming widely used. With these advances in technology, there is now little reason to continue to use emission-factor-based estimates for Scope 1 emissions in the oil and gas industry.

While the issue of emission inventory discrepancies may be industry-specific, it is absolutely a material issue for investors as well as an issue that has major ramifications for our understanding of climate risk. When we think about total contributions to GHG emissions, it's clear that certain industries have a more central role in our understanding of climate risk and GHG emissions than others, and the fossil fuel industry is a critical one. By some estimates, methane emissions represent about 11% of all U.S. GHG emissions, and oil and natural gas systems are the single largest contributing sector to U.S. methane emissions.[2] With such a large share of overall emissions, emissions reporting in the oil and natural gas industry demands greater accuracy than in other sectors. Many in this industry, including the array of large and small energy companies that currently use our technologies, have already invested heavily in innovative ways to understand and reduce their GHG impact. Accordingly, industry-specific emissions measurement approaches and reporting standards have been developed (such as OGMP 2.0 and Veritas) and are rapidly gaining traction. We discuss these measurement approaches and reporting standards in more detail below.

---

[1] Hon Xing Wong et al., "ESG Investing and the US Oil and Gas Industry: An Analysis of Climate Disclosures" (Columbia University SIPA, Center on Global Energy Policy, April 2022), https://www.energypolicy.columbia.edu/sites/default/files/pictures/Upstream_ESG_Final%20(1).pdf.

[2] *Overview of Greenhouse Gasses, EPA.* https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane

While the proposed SEC rule and the GHG Protocol leave the door open to measurement-based emission disclosure, neither provides clear guidance that measured emission data is essential or includes guidelines on how to implement consistent measurement-based standards. Inconsistently applied emissions estimates or measurements result in a serious comparability problem, which in turn will fail to produce accurate information for investors.

Why is the discrepancy between TCFD and industry-specific standards material to investors?

The GHG Protocol, which was developed with a global view and established approximately twenty years ago, offers a valuable but incomplete framework, lacking, in particular, the latest information on GHG emissions for critical sectors. As stated above, much of our understanding on GHG emissions has been born out of rapid advancements in the ability to measure methane emissions more accurately at a wide scale using new technologies—and much of this capability was developed in the last five years, and therefore not clearly outlined in standards like the GHG Protocol. This creates a major gap in what we understand about GHG emissions today, compared to what companies would be required to disclose under the SEC's Proposed Rule. In essence, the SEC would be handing investors incomplete and potentially misleading information on Scope 1 GHG emissions.

The SEC must balance granularity and accuracy of data with accessibility and consistency in its reporting standards. In our organizations' view, the SEC should provide direction on oil and gas industry-specific standards that require Scope 1 emissions measurement for two key reasons:

1. Discrepancies in emissions calculations using emissions factors and those using more accurate industry-specific and measurement-based approaches are pervasive and significant.

2. Industry-specific standards for the oil and natural gas industry exist and are gaining traction as disclosure methods that can provide auditability and comparability.

With respect to the first point, numerous recent studies using advanced measurement techniques have found significant discrepancies between measured emissions and reported GHG emissions calculated with emission factor-based methods. One such example is an analysis by Rutherford et al.[3] The study found that field measurements of methane emissions are 1.5 to 2 times greater compared to official GHG inventory (GHGI) estimates based on emissions factors, and that certain industry segments have larger discrepancies than others. As the study authors note, this discrepancy may be in part because the emission factors that underpin the GHGI instruments are in some cases based on 30-year-old, outdated information.

Another example from Chen et al. revealed that actual methane emissions from the Permian Basin are perhaps six times higher than GHGI estimates, based on a large-scale measurement

[3] Closing the methane gap in US oil and natural gas production emissions inventories https://www.nature.com/articles/s41467-021-25017-4

campaign that relied on hundreds of thousands of aircraft-based site measurements.[4] Yet another example from Zavala-Araiza et al. found discrepancies between measurement-based calculations of emission intensities and emissions factor-based calculations.[5] As those study authors point out, the discrepancies between measured GHG emissions and emissions factor-based estimates "lead to conflicting claims about the climate implications of fuel switching from coal or petroleum to natural gas."

Undoubtedly, accurate representations of GHG emissions from the oil and gas industry are of material interest to investors, and the SEC should prioritize an emission disclosure framework that provides investors with the best possible information. As our methane emissions understanding continually improves with use of advanced technologies, a particular company or investment may look significantly different based on accurate, measurement-based data than it would using the outdated emissions factor-based calculation methods described in the GHG Protocol.

To underscore the significance of this discrepancy, we have also observed that not only do emissions factor-based techniques fail to accurately account for GHG emissions at the industry level, companies' actual emissions also vary widely from their reported totals under factor-based inventory techniques.

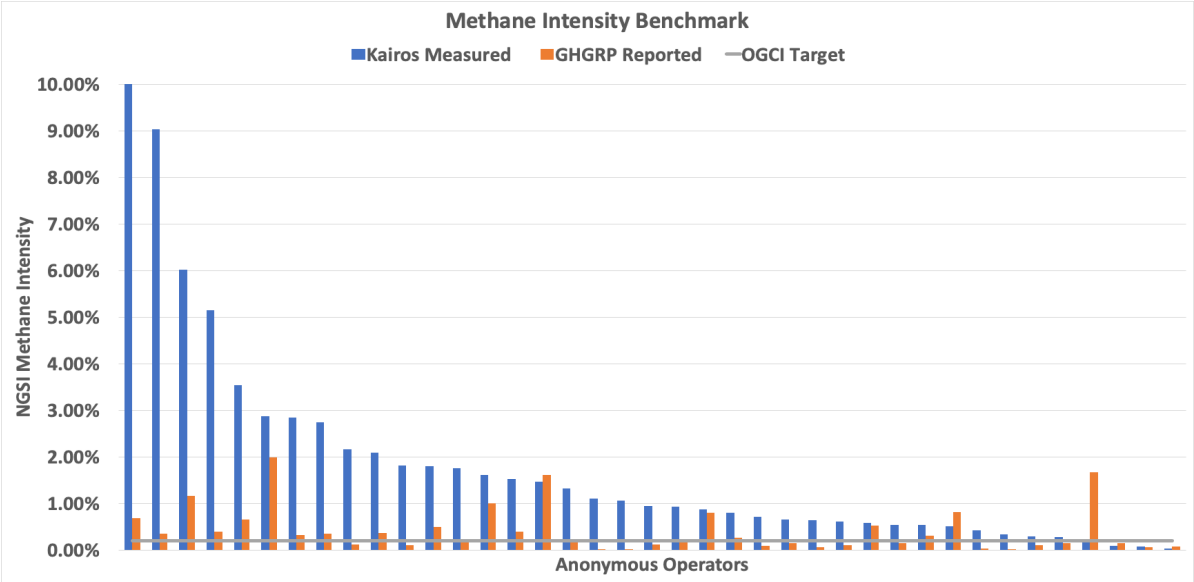

Figure 1: Methane intensity as measured by aerial methane monitoring vs. GHGRP reported emissions and the Oil and Gas Climate Initiative (OGCI) target. The OGCI target is a methane intensity target set by member companies to reduce the average methane intensity of aggregate upstream oil and gas

[4] Quantifying Regional Methane Emissions in the New Mexico Permian Basin with a Comprehensive Aerial Survey. https://pubs.acs.org/doi/10.1021/acs.est.1c06458

[5] Reconciling divergent estimates of oil and gas methane emissions https://www.pnas.org/doi/full/10.1073/pnas.1522126112

operations to well below 0.20% by 2025, aiming for near zero methane emissions. Kairos Aerospace measurements suggest widespread exceedances of the current OGCI target. The y-axis limit is set to 10% methane intensity. The maximum methane intensity in this benchmark is 24% (beyond the limits of the chart area). Each bar signifies an individual anonymous producing company.

Figure 1, courtesy of Kairos Aerospace, depicts the observed emissions for individual operators compared to their reported methane emissions according to the EPA Greenhouse Gas Reporting Program (GHGRP) and the OGCI emission intensity target. Moving towards measured data in the SEC's climate disclosures methodologies is imperative to protect investors in this sector. When measurements can be made with proven accuracy, the use of emissions factors should be considered unacceptable. Additionally, providing investors with insight into a company's true field performance will give a clear and well-deserved benefit to the companies that already outperform their emissions-factor-based inventory estimates.

Methane measurement techniques have become increasingly accurate, affordable, and available at scale in recent years. Figure 2, courtesy of Bridger Photonics, Inc., shows emissions measured from an aircraft platform (vertical axis) versus actual (horizontal) on-ground emission rates from controlled releases.[6] Bridger's highly accurate Gas Mapping LiDAR™ offers a more comprehensive view of emissions than traditional ground-based methane detection techniques. This is critical because aerial measurement techniques like the one utilized by Bridger reveal as much as 18 times more methane emissions from sites compared to previous generation leak detection technology.[7] These large discrepancies underscore just how important emissions measurement is for understanding the total contribution of methane from this sector.

[6] Each light blue data point in the figure represents a single measured emission rate estimate for an aerial (aircraft) flight pass, while the darker blue symbols represent the average value for each nominal emission rate, both shown as functions of the ground-measured emission rate ("truth"). The proximity of the data and the red linear fit to the green 1:1 ratio line indicates high accuracy for emission rate quantification. This study indicated an aggregate emissions inventory within 4% of the actual inventory. For more information on this, please see the full Bridger Photonics' whitepaper, Bridger Photonics, Inc., "Performance of Gas Mapping LiDAR™ for Quantification of Very High Methane Emission Rates," June 7, 2021. https://www.bridgerphotonics.com/sites/default/files/inline-files/BridgerPhotonics_HighControlledReleaseRates.pdf.

[7] Tyner & Johnson. "Where the Methane Is—Insights from Novel Airborne LiDAR Measurements Combined with Ground Survey Data" (2021), https://pubs.acs.org/doi/10.1021/acs.est.1c01572

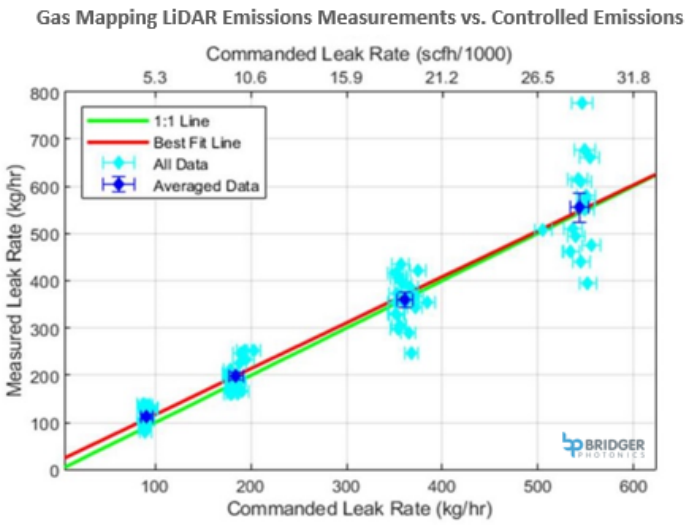

Figure 2: Emissions measurements using Bridger Photonics' Gas Mapping LiDAR™ compared to controlled emission releases show that Gas Mapping LiDAR accurately quantifies emission rates from an airborne platform. Each light blue data point in the figure represents a single measured emission rate for an aerial (aircraft) flight pass, the green line represents the "ideal" 1:1 ratio, and the red line is a linear fit to the data.

Other technologies are also capable of accurate quantification and can be used to improve emission reporting.[8,9] Figure 3, courtesy of GHGSat Inc., shows on the left a scatter plot of emissions measured from a satellite (vertical axis) versus actual on-ground emission rates from controlled releases (horizontal axis), and on the right an example of a concentration map of a satellite observation of a controlled release. Each GHGSat satellite is equipped with an advanced methane sensor with a spatial resolution of less than 30 meters and a detection threshold of 100 kilograms per hour – a crucial capability for the facility-level attribution of emissions. The objectives of the SEC's proposed Enhancement and Standardization of Climate-Related Disclosures for Investors rule could be supported by a measurement methodology that combines satellites, aircraft/drones, and ground-based sensors in a tiered system-of-systems approach. Satellites could monitor on a frequent basis with an emphasis on high-risk areas, detecting very big emissions quickly, about 50% of methane leaked by volume. Airborne instruments could be dispatched periodically to survey areas of interest, with emphasis on the high-risk areas identified by satellites. The objective of airborne monitoring would be to measure large leaks that contribute approximately the next 40% of emissions by volume. Finally, mobile drone and/or ground-based sensors could then be deployed to measure the remaining emissions, which cumulatively, across all operations, can also be significant, but would not be seen by satellite or airborne devices, due to their relative higher minimum detection threshold.

[8] Evan D. Sherwin et al., "Single-Blind Test of Airplane-Based Hyperspectral Methane Detection via Controlled Releases", Elementa 9, no. 1 (2021): undefined-undefined, https://doi.org/10.1525/elementa.2021.00063
[9] Daniel J. Varon et al., "Quantifying Methane Point Sources from Fine-Scale Satellite Observations of Atmospheric Methane Plumes", Atmos. Meas. Tech., 11, 5673–5686 (2018), https://doi.org/10.5194/amt-11-5673-2018

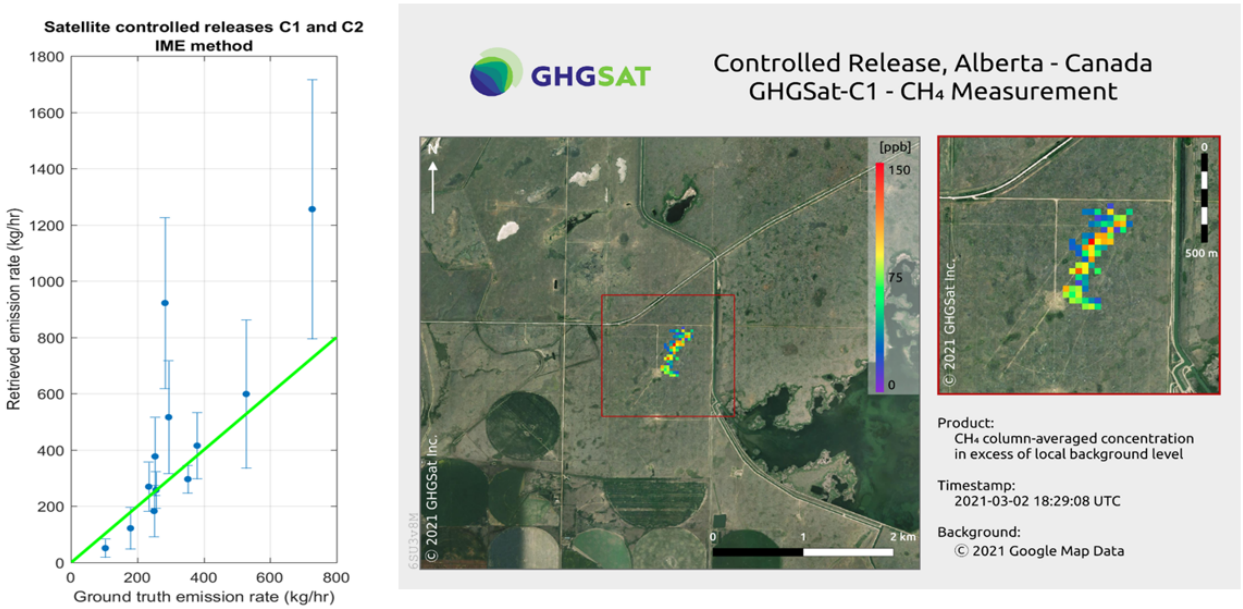

Figure 3: Scatter plot of emissions measurements from a GHGSat satellite compared to controlled releases (left) and an example of a concentration map of a satellite observation of a controlled release (right). Each blue data point on the scatter plot represents a satellite observation and the ideal 1:1 correlation line is shown in green. Data points within 1-sigma of the correlation line indicate a well calibrated system.

An example of how drone-based systems can accurately characterize and quantify these smaller rate releases can be seen in Figure 4, courtesy of SeekOps Inc., which shows a scatterplot of measured flowrates against those calculated by the drone-deployed in situ tunable diode laser absorption spectrometer (TDLAS) measurement system during elevated controlled releases, representative of emissions from offshore platforms, flares or other sources significantly above ground or difficult to access with incumbent ground-based technologies such as Optical Gas Imagers (OGI)[11].

[11]Corbett, A; Smith, B. A Study of a Miniature TDLAS System Onboard Two Unmanned Aircraft to Independently Quantify Methane Emissions from Oil and Gas Production Assets and Other Industrial Emitters. *Atmosphere* **2022**, 13, 804. https://doi.org/10.3390/atmos13050804

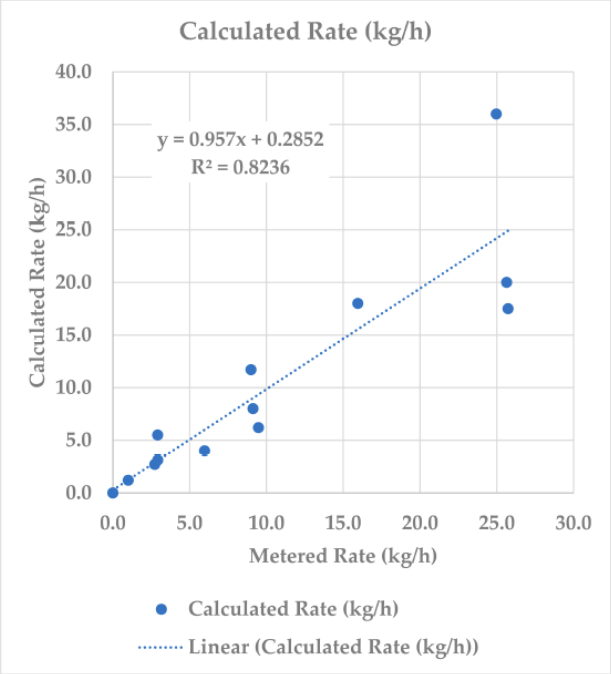

Figure 4: Scatterplot of absolute error of perimeter drone flight pattern calculated emissions rates derived from high accuracy methane concentration and wind measurements versus controlled release flowmeter tests using the SeekOps Inc sensor[11].

Continuous, ground-based sensors are also capable of quantifying emissions, providing critical added information about the time-varying nature of emissions from oil and gas. Given known intermittency in emissions, this added dimension of measurement can provide higher confidence in overall GHG impacts. Figure 5, courtesy of LongPath Technologies, demonstrates how the LongPath fixed, ground-based sensor provides reliable quantification of emission rates over time. The points on the graph show the LongPath system's ability to accurately quantify emission rates ("Estimated Emission Rate" on the y-axis) against controlled releases in 3rd-party administered blind tests ("True Emission Rate" on the x-axis), both at the METEC test facility and in the field against operational venting.

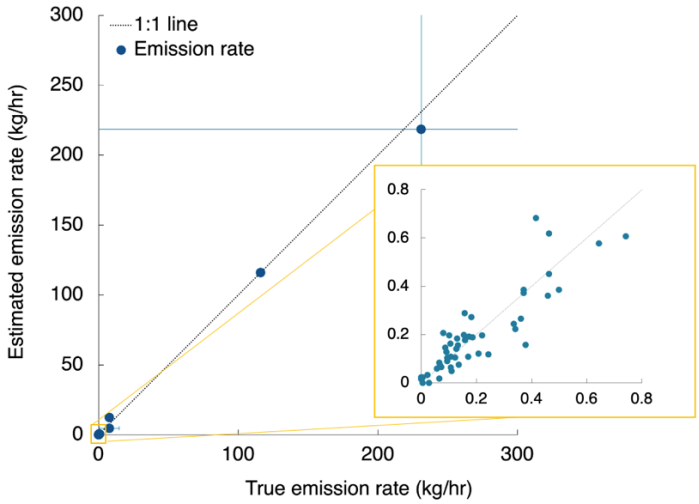

Figure 5: Scatterplot of 3rd-party blind testing of LongPath Technologies continuous, ground-based sensor's accuracy in quantifying emission rates in both controlled and field settings across a range of rates, from below 0.1 kg/hr to above 200 kg/hr.

What industry-specific standards exist that can close this gap?

As of today, there are several industry-specific emissions reporting standards for the oil and natural gas industry that can be used. When selecting a standard, the SEC should be sure to require the use of widespread measurement whenever possible. However, different measurement-based approaches will vary widely in quantification accuracy and sensitivity, and self-reported data is inherently biased. For transparency and credibility, it is therefore *crucial* that the chosen standard requires third-party verification of emission measurement submission. These submissions should be evaluated by an independent third-party auditing body that can review emissions disclosures with scientific rigor. This ensures that the company and the auditing body maintain credibility.

One such standard to consider is the Oil and Gas Methane Partnership (OGMP) 2.0 Level 5 Standard. According to OGMP 2.0, *"The OGMP 2.0 is the only comprehensive, measurement-based reporting framework for the oil and gas industry that improves the accuracy and transparency of methane emissions reporting in the oil and gas sector. Already over 70 companies with assets on five continents representing 50% of the world's oil and gas production have joined the partnership."* OGMP 2.0 was launched by the U.N. Environment Program and the Climate and Clean Air Coalition and, in addition to its industry supporters, is supported by leading governmental and non-governmental organizations like the European Commission, the U.K., and the Environmental Defense Fund. The Level 5 OGMP reporting standard requires site-level measurement to provide a mechanism to verify emissions and avoid discrepancies between inventory approaches. The Environmental Defense Fund has even recognized OGMP Level 5 as the standard to which emissions measurement reporting plans must be held.

The OGMP 2.0 Level 5 framework bridges the gap between traditional, emissions factor-based emission disclosure frameworks and the advancements in measurement technologies. OGMP Level 5 has the critical mass, industry-level knowledge, and focus to evaluate specifics around how to implement measurement-based emissions reporting. We understand that this level of reporting detail would be unmanageable for the SEC to expect at the economy-wide level, but this available and accepted standard in the oil and gas industry makes it a feasible option to use as an industry-specific requirement.

The OGMP Level 5 framework is just one of several possible standards to incorporate measurement into emission disclosure requirements. The Gas Technology Institute's Veritas Initiative is another possible standard for the oil and natural gas industry that is gaining traction as a broadly accepted, measurement-based emission disclosure framework. Veritas is currently under development and can fill in the gaps that currently aren't covered by the 2004 GHG Protocol, from measurement protocol development to emission factor reconciliation protocols, all designed to bring greater clarity and transparency to oil and natural gas industry emission disclosures. Like OGMP Level 5, there is strong industry interest in this framework as a tool to bring consistency and clarity to emission disclosures.

A third approach we encourage the SEC to consider is to use differentiated gas protocols to obtain measurement-based emission data. Rigorous, independent differentiated gas standards can be used by companies to obtain certifications of methane intensity, but they also lay out a clear, measurement-based, and data-driven approach to evaluating methane intensity. Were the SEC to adopt differentiated gas measurement and reporting methodologies, companies would not need to seek full certification but simply apply the principles around measurement and emission accounting.

An effective emission disclosure framework that incorporates measurement over outdated emission factors will, by design, have requirements for what constitutes appropriately rigorous standards for emissions measurement. By relying on the existing expertise contained within OGMP Level 5, Veritas, and differentiated gas standards, the SEC can draw upon existing work without needing to go through the cumbersome process of developing its own standards and processes. Understanding what constitutes effective emissions measurement techniques is highly nuanced and industry-specific, but it's also critically important to improving the overall accuracy and comparability of emissions reporting. Simply put, the SEC cannot move to measurement without ensuring that all GHG measurement techniques being used have gone through a thorough validation process. These third-party accounting protocols such as OGMP Level 5, Veritas, or differentiated gas standards may validate the measurement technologies companies intend to use to ensure that they capture meaningful levels of emissions prior to use in the respective protocol.

Industry-based standards can be complementary

TCFD reporting standards do not rule out the use of measurement for the purpose of calculating GHG emissions, but at the same time they do not clearly articulate that

measurement is required. These standards also do not provide clear guidance on *how* measurement can best be utilized. Industry-based standards could bridge this gap.

We recognize that emissions factor-based approaches under TCFD can serve as the foundation for some of the emission calculations that cannot feasibly be measured, such as Scope 3 emissions for a large multinational oil company. We see the industry-standard approach as complementary to those frameworks, providing better information wherever possible, but not entirely replacing factor-based approaches in all instances. Our organizations believe that measurement is critical to understanding the real world GHG footprint of an industry or company, and measurement-based reporting produces the best available data for investors. We believe that the rule as proposed will not accurately capture Scope 1 GHG emissions, but by adopting these more tailored, industry-specific protocols, investors will have clear and comparable information from which to make decisions.

Conclusion

The undersigned organizations greatly appreciate the opportunity to provide the SEC with comments on the proposed rule. While we recognize the challenge posed by establishing economy-wide standards for Climate Disclosure, we believe the use of high-quality data in emissions reporting whenever possible is imperative for investors seeking to objectively evaluate climate-related risks and must be at the heart of the SEC's objectives. While imposing measurement-based standards may not be feasible everywhere, that cannot be a barrier for imposing measurement-based standards anywhere. Neither the GHG Protocol nor the SEC rule itself clearly articulate that measurement-based approaches provide better data and should be favored, nor do they define how measurement-based standards will be applied consistently. We believe the 1) measurement-based technologies are widely available and should be used, and 2) industry-based frameworks described in this letter like Veritas, differentiated gas standards, or OGMP Level 5 can close this critical gap.

We believe that a sensible middle ground that utilizes industry-specific frameworks over less rigorous general standards will provide the SEC with a pathway to incorporate measurement practices. This in turn will greatly expand the benefits of the rule by providing investors with better information without creating excessive burden for the oil and gas industry. Since the measurement-based standards discussed here have been developed with input from leading academics, policymakers, and industry operators themselves, they represent a more thorough framework for measuring and disclosing emissions than the generalized approach of TCFD.

Sincerely,

Pete Roos
CEO
Bridger Photonics

Mark Smith
President
Clean Connect Inc.

Eric Choi
Director, Business Development
GHGSat

Ryan Streams
Vice President, Policy and External Affairs
Kairos Aerospace

Stefan Bokaemper
CEO
Kuva Systems

Caroline Alden, PhD
Co-Founder & VP Product and Markets
LongPath Technologies, Inc.

Brian Miller
Senior Vice President, Public Policy and Growth
Project Canary

Eric Wen
COO
Qube Technologies

Iain Cooper
CEO
SeekOps Inc.